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The TOBACCO BUDWORM

AND ITS CONTROL IN THE GEORGIA AND FLORIDA TOBACCO-GROWING REGION

IN THE Georgia-Florida tobacco belt the ravages of the tobacco budworm are ordinarily exceeded only by those of one other insect attacking the crop. The larvae, or "budworms," hatching from eggs laid on the leaves by a greenish moth, begin their depredations as soon as they have migrated to the buds, usually about 24 hours after emergence.

To avert attacks of these budworms, seedbeds should be tightly covered with cloth to prevent the entrance of moths, and the plants in them thoroughly destroyed as soon as the beds are abandoned. Where tobacco is grown under shade cloth the walls and tops of the covering should be kept free of holes, and the cloth-covered gates which are provided for the passage of workmen, work animals, and implements should be kept closed when not in use. At the end of the harvesting season all tobacco stalks should be destroyed. A further useful practice is the plowing of tobacco fields in the fall or winter.

For control of the budworms, a poisoned bait made by mixing 75 pounds of corn meal with 1 pound of lead arsenate is efficient. Larger quantities of the poison are of no greater value and may injure the plants. The number, method, and frequency of applications needed will depend upon conditions fully set forth in this bulletin.

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THE TOBACCO BUDWORM[1] AND ITS CONTROL IN THE GEORGIA AND FLORIDA TOBACCO-GROWING REGION

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CONTENTS

A DESTRUCTIVE TOBACCO PEST

THROUGHOUT the Georgia-Florida tobacco belt the annual depredations of the tobacco budworm are ordinarily exceeded only by those of the hornworm.[3] In the tobacco-growing regions farther north this insect is a pest of less importance; in some seasons, however, it may cause considerable damage.

Although the budworm attacks all the different types of tobacco grown in this region, injury to leaves used as cigar wrapper means much more than injury to leaves which are to be used for filler or for other purposes. The injury occurring on the cigar filler, binder, and the bright types, however, is so great as to necessitate control practices.

Fortunately, very simple and efficient measures for the control of this pest are at the command of the tobacco grower.

DESCRIPTION, LIFE HISTORY, AND HABITS

The tobacco budworm passes through four distinct stages in the course of its development; the egg, the larva, the pupa, and the adult. The eggs are small, whitish, nearly dome-shaped objects, measuring about one-fiftieth of an inch in diameter. They are laid singly by the moth, usually on the under side of the tobacco leaves. In hot weather from 3 to 5 days are required for hatching.

Newly hatched budworms first feed sparingly on the shells of the eggs from which they have issued and then eat from the leaf surface small areas about the size of a pinhead. The small budworms then begin to pass to the bud[4] of the plant, which is usually reached in about 24 hours. They frequently stop to feed on the leaf surface, but as this feeding seldom goes entirely through the leaf no appreciable injury is done until the bud is reached.

[1] *Heliothis virescens* (F.); order Lepidoptera, family Noctuidae.
[2] Deceased July 28, 1931.
[3] *Protoparce sexta* (Johan.).
[4] The term "bud" in this bulletin refers to the growing tip of the undeveloped leaves of the tobacco plant.

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Upon reaching the bud the young budworms conceal themselves between the immature leaves and begin to feed ravenously. They are so small and so well concealed that they can be detected only by opening and carefully scrutinizing the bud.

From 18 to 31 days is required for the development of the larva, or budworm, in May and June. At maturity the larva attains a length of about an inch and a half (fig. 1). Its most common color is light green, with paler stripes running lengthwise of the body; but the color may vary from green to yellowish or dark reddish brown, or it may even become very dark. When fully grown the budworm enters the soil and changes to the pupa.

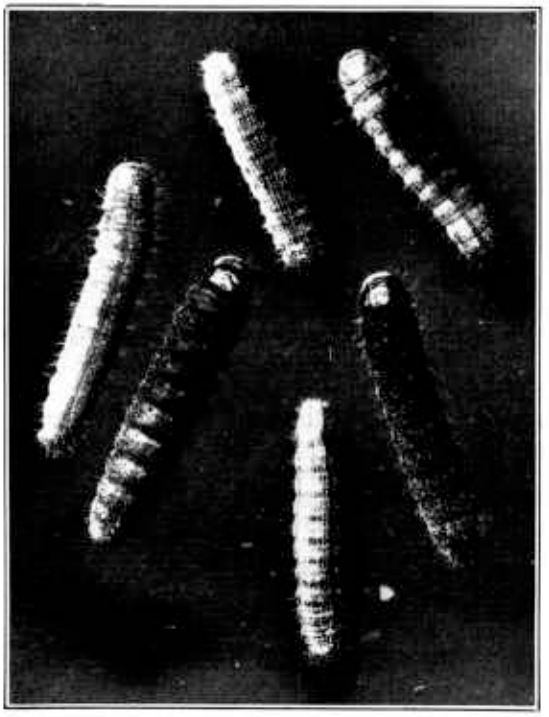

FIGURE 1.—Tobacco budworms, nearly full grown.

The pupal or resting stage (fig. 2), which is spent about an inch beneath the surface of the soil, usually requires, in the summer months, about 12 days. The brown pupa is about three-fourths of an inch in length.

The adult form of the budworm is a distinctively greenish-colored moth (fig. 3) with a wing spread of about 1¼ inches. The forewings are of a light green, obliquely crossed with three lighter stripes, while the hind wings are silvery and are bordered with a brownish fringe. The moth is active only at night but in the daytime is frequently found hidden among the tobacco leaves. When disturbed it darts quickly to a new hiding place.

NATURE OF THE INJURY

Injury to the tobacco plant is caused only by the larva, or budworm. Although some damage is done by the larger larvae feeding on the mature foliage, by far the greater part of the injury is produced in the small, immature bud leaves, and begins to occur as soon as the tiny budworms, which hatch from eggs on the outer leaves, reach the bud. Distorted leaves often result when feeding is done upon the tips of the leaves in the developing bud. When the attack is made elsewhere large, unsightly holes develop as the leaf tissue expands (fig. 4).

Both types of injury greatly lower the value of wrapper tobacco and depreciate the value of the binder and filler types (fig. 5). If the budworms are not controlled they may feed upon the plants to such an extent as to cause a considerable loss in weight (fig. 6). Frequently the entire bud may be eaten away and the plant consequently stunted.

FIGURE 2.—Pupa of the tobacco budworm (greatly enlarged).

SEASONAL HISTORY

In Georgia and Florida the moths sometimes appear early enough in the spring to infest the seedbeds. Usually the young budworms begin to appear in destructive numbers about the time when tobacco plants have become established in the fields. From this time, until the end of the growing season, eggs and larvae are present in tobacco fields.

The first generation of the budworm requires about 46 days for its complete life cycle, but the later generations may complete their development in a period of about 33 days.

The first two broods confine themselves almost entirely to tobacco. They overlap to a great extent, and their numbers are sufficiently large to keep tobacco fields thoroughly infested throughout their entire period of growth.

The third brood is present mainly during the latter part of July and during August. Individuals of this brood feed upon late tobacco and upon beggarweed,[5] which becomes abundant at this season of the year.

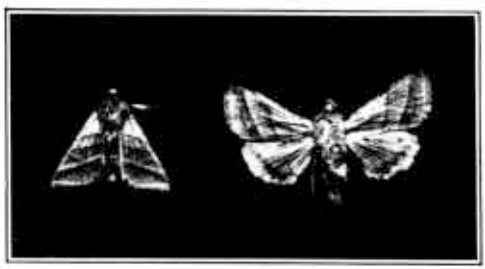

FIGURE 3.—The adult, or moth, of the tobacco budworm. In its natural position at rest and with wings spread.

A fourth and possibly a fifth brood are also present in the fall months. The winter is passed in the pupal stage, in the ground.

FOOD PLANTS

Tobacco and beggarweed are the preferred food plants of the tobacco budworm. Aside from these two hosts, the larvae feed to a limited extent upon tomatoes, garden peas, sweet peas, and a number of wild and cultivated plants. The corn earworm,[6] which closely resembles the tobacco budworm, and is sometimes called the false budworm, seldom attacks tobacco in this region.

[5] A species of *Meibomia*.
[6] *Heliothis armigera* Hbn.

NATURAL ENEMIES

If it were not for the assistance of numerous parasitic and predacious enemies of the budworm, the infestations in tobacco fields would undoubtedly be much greater. One of the important predacious enemies is a grecnish spider,[7] which is extremely common on tobacco plants in the South. Another is a certain wasp,[8] which destroys many of the larger larvae.

A fly [9] closely resembling the common housefly acts as a parasitic enemy of the budworm. It deposits on the body of the budworm tiny maggots which burrow into their host, and after feeding for some time finally destroy it.

FIGURE 4.—Tobacco tip, showing serious budworm injury.

The most important natural enemy of the tobacco budworm, however, is a small, black-winged, red-bodied, wasplike insect [10] (fig. 7) which is often seen hovering around the tobacco plants. Upon finding a small budworm, this insect quickly inserts an egg in its body. The parasite which hatches from the egg feeds within the body of the budworm and ultimately destroys it. The mistaken impression has existed in this region that the adult parasite found flying around tobacco buds is the parent of the budworm.

CONTROL

THE USE OF POISONED CORN MEAL

The nature of the attack of the budworm necessitates direct application of poison to the affected bud, if efficient control is to be obtained. Neither dusting nor spraying plants has given satisfactory control.

[7] *Peucetia viridans* Hentz.
[8] *Polistes fuscatus* var *bellicosus* (Cress.).
[9] *Sarcophaga lambens* Wied.
[10] *Cardiochiles nigriceps* Vier.

At the present time the best known method of controlling the tobacco budworm is to apply poisoned corn meal to the buds attacked. A mixture which has proved very satisfactory consists of 1 pound of lead arsenate and 75 pounds of corn meal, or 6 heaping teaspoonfuls of the arsenical to 1 peck of corn meal.

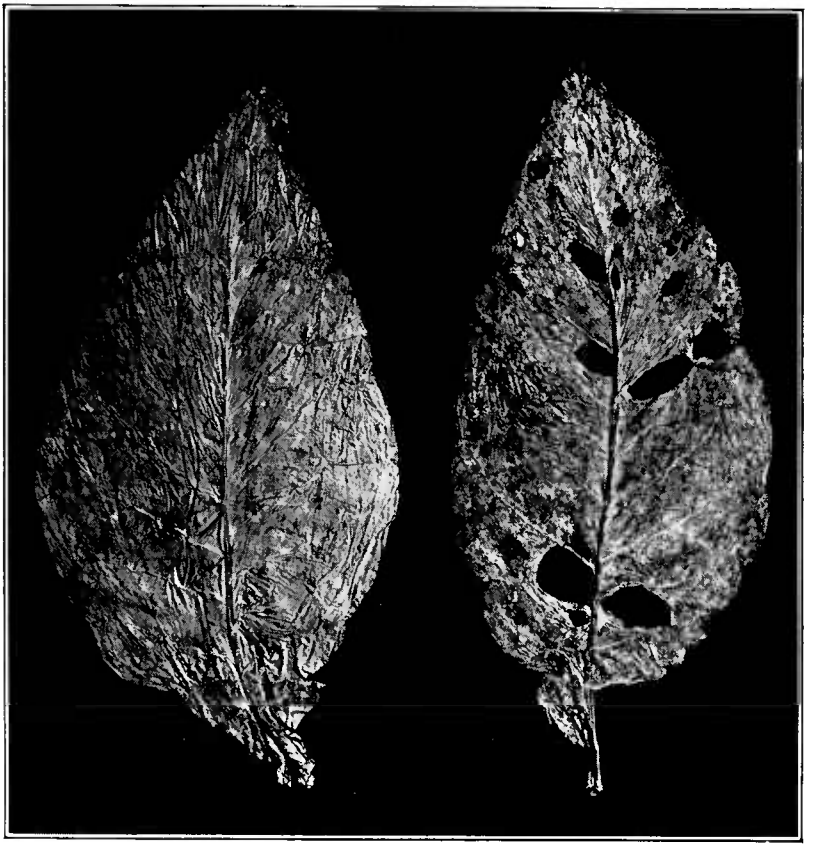

FIGURE 5.—Illustration of injury caused by the budworm. Cured leaves, injured (right) and uninjured (left).

HOW TO PREPARE THE BAIT

In the preparation of the bait care should be taken to obtain an even distribution of the poison throughout the corn meal. The corn meal should not contain much coarse husk. Small quantities of the bait can be prepared by mixing the ingredients by hand in a bucket or some other container. Mechanical mixers can be employed where large quantities are to be prepared. Mixtures containing a greater proportion of poison are found to be no more effective. Moreover, this mixture may be used with a greater degree of safety than other preparations which in some instances give fairly good budworm con-

trol. About 10 to 12 pounds of the mixture per acre should be used for each application.

Cottonseed meal, lime, sand, and other substances are sometimes used in place of corn meal in the poison mixture, but have been found

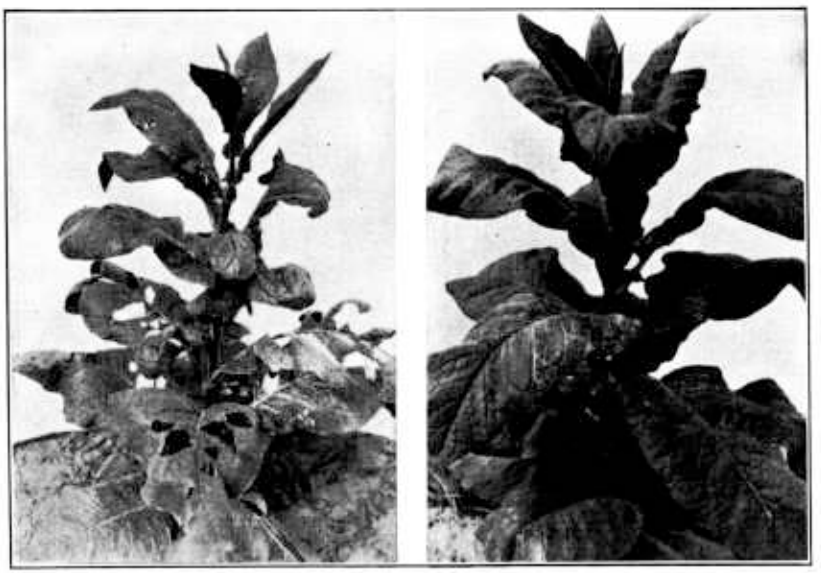

FIGURE 6.—Budworm injury to bright tobacco. Injured plant at left, uninjured plant at right.

to be much inferior. The extreme efficiency of the mixture of corn meal and lead arsenate is due to the attractiveness of the corn meal to the tobacco budworm.

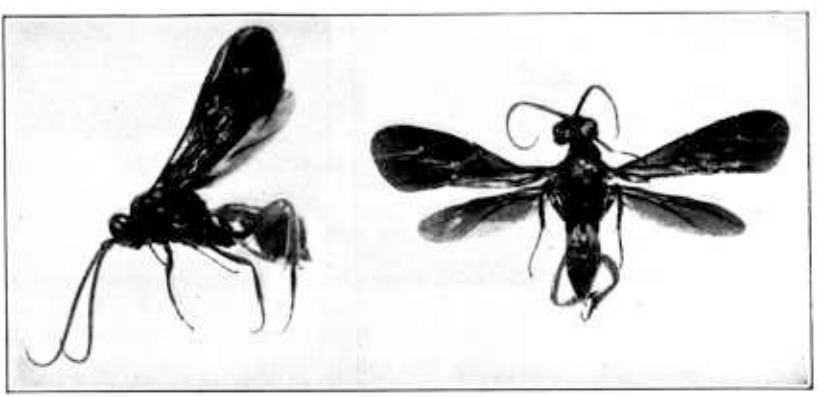

FIGURE 7.—*Cardiochiles nigriceps*, an important parasite of the tobacco budworm.

Calcium arsenate and paris green should not be used as substitutes for lead arsenate, as under certain weather conditions they may cause severe burning of the foliage.

Caution.—As this mixture is both attractive to and very poisonous to domestic animals, it should always be kept in a safe place.

HOW AND WHEN TO APPLY THE POISON

A small quantity of the poison mixture should be dropped with the hand into the center of the bud. The necessity of applying the mixture directly to the bud is greatly emphasized, since applications carelessly made are of small value. The first two or three applications may be made by means of a quart can, fastened to a stick, with ten-penny-nail holes in the bottom (fig. 8). As the plants increase in size the bud leaves become more tightly folded, and it is then necessary to apply the remedy with the hand (fig. 9). When the buds are closed they should be opened with one hand while a small pinch of the poison mixture is dropped in with the other. The poisoned bait can be conveniently carried in a small cloth sack or bag, attached to the waist, thus allowing the operator full freedom of both hands. Although the application with the can is somewhat quicker than that with the hand, some growers of wrapper tobacco prefer to use the latter exclusively. An adult laborer should be able to treat from 1 to 2 acres per day, the area depending somewhat on the type and age of the tobacco.

FIGURE 8.—Applying poison mixture to the tobacco buds by the stick-and-cup method.

The advisability of applying only a small pinch of the poison mixture to each bud should be emphasized, as excessive quantities may cause some injury to the tender bud leaves in wet weather. This applies especially to shade-grown wrapper tobacco, the bud leaves of which are very susceptible to injury by poison.

In the case of cigar-wrapper tobacco, poisoning should be begun as soon as the plants have become established in the field. Experience has shown that at least two applications a week are necessary to protect the bud fully during normal growing weather. When growth is much retarded by severe drought one application per week may be sufficient, and this will avoid an excessive accumulation of poison, which may be harmful to the plant. The applications should be continued until the tobacco is topped.

The number and frequency of poison applications necessary to protect tobacco grown for cigar binder or filler or for cigarette manufacture will vary from one season to another. Cigar-filler and cigarette tobacco will ordinarily be protected sufficiently by one application each week, whereas crops raised for cigar binder may require about two applications of the poison mixture each week. The first application should be made soon after the plants have become established in the field.

FIGURE 9.—Applying poison mixture to the tobacco buds with the fingers.

GENERAL RECOMMENDATIONS

Seedbeds should be tightly covered with cloth to prevent the entrance of moths. In this way the number of eggs introduced into the fields on the plants will be held to a minimum.

The plants in seedbeds should be thoroughly destroyed as soon as the beds are abandoned. If allowed to grow throughout the season

FIGURE 10.—Grown-up seedbed which serves as a breeding place for the tobacco budworm.

they serve as excellent breeding places for this pest and contribute considerably to the abundance of moths which deposit eggs within the fields (fig. 10).

Where tobacco is grown under shade cloth, preventive measures against budworm attack may be practiced with considerable success. In such cases the walls and top should be kept as tight as possible. Since it is necessary to provide openings in these shades through which workmen with farm animals and implements may come and go, gates covered with cloth should be provided and kept closed as much as possible to exclude moths.

At the end of the harvesting season the tobacco stalks should be cut down or otherwise destroyed. Plants left standing in the fields provide breeding places for the budworm as well as for other insect pests.

The plowing of tobacco fields in the fall or winter months undoubtedly results in the destruction of many budworm pupae in the soil, and reduces the number of moths that will emerge in the following spring. This practice is also very destructive to the tobacco hornworm, which overwinters in the soil.

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